

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

Review of the Commission's Rules)	
Regarding the Pricing of Unbundled)	WC Docket No. 03-173
Network Elements and the Resale of Service)	
by Incumbent Local Exchange Carriers		

**JOINT DECLARATION OF
TERRY L. MURRAY AND CATHERINE E. PITTS
ON BEHALF OF AT&T**

December 16, 2003

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I. QUALIFICATIONS & BACKGROUND

A. Terry L. Murray

1. My name is Terry L. Murray. I am President of the consulting firm Murray & Cratty, LLC. My business address is 8627 Thors Bay Road, El Cerrito, CA 94530.
2. I am an economist specializing in analysis of regulated industries. I received an M.A. and M.Phil. in Economics from Yale University and an A.B. in Economics from Oberlin College. At Yale, I was admitted to doctoral candidacy and completed all requirements for the Ph.D. except the dissertation. My fields of concentration at Yale were industrial organization (including an emphasis on regulatory and antitrust economics) and energy and environmental economics.
3. My professional background includes employment and consulting experiences in the fields of telecommunications, energy and insurance regulation. As a consultant, I have testified on telecommunications issues in proceedings before

state regulatory commissions in Alaska, California, Connecticut, Delaware, the District of Columbia, Florida, Georgia, Hawaii, Illinois, Indiana, Kansas, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nevada, New Jersey, New York, North Carolina, Oklahoma, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Washington and Wisconsin, and before the Federal Communications Commission (“FCC” or “Commission”). My testimony in these proceedings has concerned such issues as costing and pricing for retail services; unbundled network elements (“UNEs”) and interconnection; universal service policy; competition policy (including policy toward proposed mergers); and incentive regulation.

4. Before I became a consultant in 1990, I was employed in a variety of positions (including Director of the Division of Ratepayer Advocates) at the California Public Utilities Commission (“CPUC”) for approximately six years and had significant responsibility for telecommunications matters. I have also taught economics and regulatory policy at both the undergraduate and graduate levels.

B. Catherine E. Pitts

5. My name is Catherine E. Pitts. I am a consultant to AT&T on switch cost modeling issues. My business address is 810 Long Drive Road, Summerville, South Carolina.
6. I have an MBA from Rutgers University, New Jersey, and eighteen years of experience in the telecommunications industry. Before becoming an independent

consultant in 2001, I was employed for five years by AT&T Corporation as a District Manager in Regulatory and Legislative Affairs. Prior to joining AT&T, I was employed by Bellcore (now Telcordia Technologies) for 13 years. While at Telcordia, I was one of three individuals who designed and implemented new incremental costing methodology into the Switching Cost Information System/Intelligent Network (“SCIS/IN”) model. The SCIS/IN model is used to identify the costs associated with switching “features” (e.g., call waiting, call forward, and caller ID) and belongs to the family of SCIS models used to determine the costs associated with switching in general. I was Telcordia’s lead subject matter expert on feature costing, as well as a subject matter expert on the 1ESS, 1A ESS and 5ESS switches. When I was promoted to lead the SCIS group of approximately 20 people, I was responsible for the technical development, production, documentation, and customer care for the Switching Cost Information System/Model Office (“SCIS/MO”) and SCIS/IN models.

7. My experience also includes extensive consultation in the use of cost models in various cost studies in the United States and abroad. I have presented expert testimony regarding switching investments and costs in numerous UNE and Universal Service Fund (“USF”) proceedings, both at the state level (section 252 arbitration proceedings) and at the federal level (section 271 proceedings).

II. SUMMARY OF DECLARATION

8. This declaration covers two of the most critical issues relating to the pricing of unbundled switching: (1) How should the cost of switches be estimated? and (2)

Over which service units should the costs of switching and other related equipment be recovered from a purchaser of unbundled switching? We understand that these issues must be resolved in the context of the Commission's review of the Total Element Long Run Incremental Cost ("TELRIC") standard used to determine the appropriate charges for UNEs purchased by competitive local exchange carriers ("CLECs") from the incumbent local exchange carriers ("ILECs").

9. As discussed more fully below, determining the economic cost of switching investment involves more than simply calculating an appropriate switch discount. The real question is the *net* economic cost of switching capacity over the long run. This question is best answered through a "life-cycle" analysis, which determines the present value of the cost of new switch capacity to serve current demand and additional capacity over the life of the switch to serve line growth. The optimal tradeoff between new and growth switch investment can be computed to develop a switch price or switch discount input for use in the various models to determine switching investment.
10. The information necessary to make these calculations must be determined with care. Information on the switch prices and discounts available to the incumbent is vital to the determination of appropriate switching investment. The Commission must take steps to prevent incumbent LECs from withholding this information from state commissions and interested parties in UNE pricing proceedings. In addition to information on switch prices and discounts, the appropriate rate of line

growth must be determined, and it should take account of both short-term and long-term factors affecting such growth. The cost of capital, the frequency of growth additions (*e.g.*, every two or three years), and the economic life of the switch are used in making these calculations, but the cost of future technology should not be included in the calculation of switching investment. With this information, the relative weighting of new switch and growth addition investment can be determined based on the present value of each component over the life cycle of the switch. These relative percentages can then be applied either to a switch model such as SCIS using switch *discount* inputs or to a model such as the HAI model that uses switch *price* inputs.

11. On the issue of switching rate structure, we agree with the decision of this Commission's Wireline Competition Bureau in the *Virginia Arbitration Order* and state decisions in Illinois, Indiana, Minnesota, Utah, and Wisconsin recovering switching costs through a flat, per-port charge. Switching costs are largely non-traffic-sensitive, as the substantial memory and processing capacity now available in current switches means that switches will not exhaust (and thus will not incur variable costs) in handling usage growth. For the small portion of costs that are traffic-sensitive, the theoretically correct price structure – recovering these costs from usage charges for peak-period use – is impractical. Of the two practical alternatives available – a flat, per-port charge or minute-of-use charges for all users – the flat, per-port charge is preferable. The flat, per-port charge ensures that the incumbent and CLEC face similar cost structures, and the flat, per-port charge mirrors the “all you can eat” flat, per-line charges generally

imposed by incumbents for mass-market retail customers. Thus, the flat, per-port charge is the appropriate method of recovering switching costs.

III. THE COST OF A SWITCH SHOULD BE BASED ON THE COST OF PURCHASING AND INSTALLING A SWITCH TO SATISFY CURRENT AND EXPECTED FUTURE DEMAND.

12. The Commission seeks comment on appropriate “switch discounts” to be used in switch cost models. However, computing switch discounts is only a means to the ultimate end: properly estimating the net switch investments incurred by an efficient carrier. Some cost models (*e.g.*, the SCIS cost model used by Verizon and BellSouth) compute switch investments by first estimating the cost of a switch based on vendor list prices, and then applying the “switch discount” that vendors offer the ILEC when the ILEC actually purchases switches. Other cost models (*e.g.*, the cost models used by SBC and Qwest) directly compute switch costs by using the switch prices reflected in their vendor contracts, eliminating the need to estimate the discount from list prices. Accordingly, rather than focusing on the proper computation of switch discounts, we address first the core issue of determining the best method of estimating the cost of a switch.

A. The Commission Should Adopt A Long-Run Economic Cost Methodology For Computing Unbundled Switching Rates.

13. The Commission has sought guidance on the appropriate methodology for determining switching costs, including the time horizon within which switching costs should be considered. Notice ¶ 78. Of the two basic choices – a long-run economic cost model or a short- or intermediate-run economic cost model – long-

run economic costs are the appropriate standard. The long-run economic costs reflect all the economic costs of switching incurred to provide that function. By contrast, a short- or intermediate-run economic model generally will not reflect all the appropriate economic costs of switching.

14. The reason is simple. In the short or intermediate run, a large portion of the switching investment in an efficient carrier's switching plant is "sunk." Sunk investment, once incurred, cannot be recovered by ceasing use of the asset and selling or otherwise disposing of it. The economic cost of sunk investment is zero, unless pricing incremental use of the asset at zero would cause demand to exceed its productive capacity (a circumstance unlikely to hold for switching capacity for the foreseeable future). *Accord* Willig Decl. Sec. IV. The only relevant economic costs to a carrier in the short or intermediate run are costs that the carrier can change over that time horizon: the costs of growth equipment to permit the existing plant to serve more lines and trunks, also called "growth additions," and any variable expenses. Therefore, the short-run or intermediate-run economic costs of switching are simply the total incremental costs divided by total expected demand, both over the relevant time horizon. This measure of cost obviously does not take into account all economic costs associated with the provision of switching in the long run.
15. By contrast, in the long run, all relevant switching costs are potentially avoidable and variable. As explained in the accompanying declaration of Professor Robert Willig, long-run economic costs are the relevant benchmark for determining the

cost of UNEs such as unbundled switching. The long-run economic costs of network elements can be used to develop prices that replicate the outcome of a competitive or contestable market for that network element. *See generally* Willig Decl. Sec. III.A.

B. The Commission Should Adopt A “Life Cycle” Methodology To Estimate Long-Run Economic Switching Costs.

16. The Commission should adopt a “life cycle” cost methodology for estimating the long-run economic cost of switching, because that approach best reflects the modular character of switching costs. A carrier normally purchases a switch capable of serving today’s demand (and often some limited increment of expected future demand), then augments that switch with “growth equipment” to serve additional future demand. A proper life-cycle theory, therefore, would reflect the initial purchase price of a switch that is capable of serving all current demand, plus the present value of any switching equipment that is added to the switch to allow the switch to serve additional demand over the life of the switch. This life-cycle approach provides an appropriate means of estimating switching costs, and it ensures that the ILEC has the same opportunity to recover its economic costs of switching that it would have in an effectively competitive market.
17. Most incumbents, in fact, choose to buy new switches to serve existing demand and some increment of anticipated near-term growth, and then purchase growth equipment to serve further increases in demand as they later materialize. This strategy gives the carrier flexibility in the timing of capacity additions to meet

uncertain demand growth. In addition, it is the capacity acquisition strategy most likely to be sustainable against new entry in contestable markets.

18. To implement a life cycle theory, it is necessary to estimate the cost of a new switch, the cost of growth equipment, future demand, the frequency with respect to which growth equipment will be added to switches to account for demand increases, the useful life of a switch, and the discount rate to calculate the present value of future growth purchases. We discuss these items in turn.

1. Incumbents Should Be Required To Provide Detailed Information Regarding Their New and Growth-Related Switching Costs In State Proceedings Related To Unbundled Switching.

19. The starting point for the analysis of switching costs is the prices at which vendors offer the switching equipment for sale. On this point, however, the incumbent LECs all too often have had a monopoly on complete and accurate information. There are no publicly available “price lists” or other public sources of information from which the incumbents’ costs of purchasing a new or growth switch can be found. Furthermore, ILECs do not buy switching equipment at list price. The four remaining Regional Bell Operating Companies (“RBOCs”) buy sufficient total volumes of equipment to warrant “most favored nation” treatment from switch vendors. Indeed, with the consolidation among RBOCs, the remaining incumbents can (and do) wield substantial market power when purchasing switches from switch vendors. As a result, these incumbents extract very favorable (low) prices for new and growth switching equipment from switch

vendors. Both the switch vendors and the incumbents prefer to keep those prices confidential. The vendor does not want other customers or its competitors to know its lowest available price, and the incumbent, in exchange for deeply discounted prices, is willing to agree to contractual terms that require the parties to maintain the confidentiality of those prices.

20. Not surprising, therefore, state commissions and competitive LECs rarely have direct access to the information necessary to accurately assess the prices for new or growth switches currently available to incumbents with substantial monopsony power. Switch vendors, of course, are not generally parties to state UNE pricing proceedings and therefore are not a useful source of switch pricing information. They also are understandably hesitant to alienate their largest customers. That leaves the incumbents, which are parties to the cost proceeding but may cite the confidentiality requirements as justification for providing only limited information in state proceedings.
21. The information available in state proceedings is uneven at best. In a small number of states, the incumbents are required to produce relevant switching contract and bid information. It is far more common, however, that only some of this information is provided. Indeed, in many states, after significant resistance by the ILEC in discovery, an incumbent may make limited disclosure, providing information relating only to small contracts (mostly for growth switches), and

thereby leave a state commission to compute switching costs based on this limited information.¹

22. In this area, state commissions need the Commission's guidance and assistance in overcoming ILEC resistance to the production of this important switching contract and bid information. Intervenors and some state commissions have repeatedly sought to obtain better switch pricing data from the ILECs. But the ILECs thwart these efforts by providing less data than requested (or no data at all). The ILECs' failure to make the switch contract and bid information available to state commissions and CLECs puts both the state commission and the CLECs at a severe disadvantage. The ILECs control the information on the switching contract and bid information, and this information should be at the center of any review of switching costs.² To ensure that state commissions have the information necessary to compute switching costs in the future, it is critically important that the incumbents be required by federal mandate to provide all relevant data. In this regard, in any state cost proceeding, ILECs should be required to provide switch price information³ for all new and growth switches

¹ The Commission's Wireline Competition Bureau experienced this ILEC intransigence first-hand in the recent Virginia Arbitration proceeding. AT&T and WorldCom sought information on switch pricing beginning in the initial round of discovery from Verizon in the summer of 2000, but Verizon did not produce the complete information on price discounts received on switches in Virginia and nearby Verizon states until after the end of the hearings in December 2000, in response to specific Staff requests for production of that information. As a result, there was no opportunity to question Verizon about the actual information during the hearings.

² Concerns about confidentiality can be addressed through protective orders or similar mechanisms, but meaningful consideration of switching costs is not possible without this critical base line information controlled by the ILEC.

³ This information may take different forms in different states – for example, in some cases, it may consist of switch contracts, while in other cases it may be price lists

purchased in the past four years, or if there are no such purchases within the past four years, the price information relating to the most recent new switches and growth equipment. This Commission should require that an ILEC must provide such information as part of any ILEC initial cost study in which the ILEC presents switching cost information, and such production should not require any intervention of the state commission or invocation of the state commission's discovery processes to obtain such information. Only by having these data can state commissions determine the proper adjustments necessary to compute current prices for new switches and future prices for growth equipment.

2. Switching Demand Estimates Should Account For Both Long-Run And Short-Run Trends in Line Growth.

23. As we noted above, life-cycle switching costs depend in part on expected demand increases (or "line growth"). Such growth expectations will vary from state to state. For this reason, assumptions about growth in determining life-cycle switching costs are best left for state commissions. However, the Commission should establish certain basic guidelines. Forecasting demand for voice telephone lines is a complex process. On the one hand, there is a strong historical trend demonstrating that demand for voice lines grows steadily from year-to-year,

showing the discount made available to the ILEC, or it may be the switch purchase orders or invoices showing the types of equipment purchased and the associated prices. Identification of the types of equipment purchased is critical to determine accurately what has been purchased and what is associated with new switch purchases, growth purchases and upgrade equipment to older switches, as well as to ensure that a variety of equipment related to power, engineering and installation are reflected accurately and not double counted by including them in switch investments and a second time through the application of various factors to switch investments.

mostly as a result of the growth in the number of households in each state. On the other hand, there are short-term economic forces that cause variations around this long-term trend. For example, in the mid-1990s, there was a short-term explosion in line growth as households purchased second lines to access the Internet. During that time, households also purchased second lines for their children (“teen” lines), and second lines for at-home businesses. Currently, there is a decline in the number of second lines, as households have canceled second lines and replaced them with broadband lines and wireless telephones. It is important for state commissions to account for, and give appropriate weight to, both the short-term and long-term trends when forecasting demand.

3. Growth Equipment Should Be Assumed To Be Added Every Two Years.

24. The life cycle of a switch includes both the new switch purchased with enough capacity to serve existing demand and some level of growth, and then the growth additions added during the useful life of the switch to handle necessary increases in capacity. According to ILEC representatives, ILECs generally engineer their switches so that growth equipment is added every two or three years to provide additional capacity to the switch.⁴ In computing the economic life cycle cost of switching, we propose using the conservative figure of two years for growth additions to a switch. All other things being equal, use of the shorter two-year

⁴ See, e.g., Testimony of Joseph Gansert, Verizon, *Virginia Arbitration Proceeding*, pp. 5265-66 (11/28/01), 5434-35 (11/29/01).

period for growth additions accelerates the timing of such additions and increases the present value of UNE costs.

4. The “Life” Of A Switch Should Reflect Its Economic Life.

25. An appropriate estimate of the “life” of a switch to be used in the life-cycle analysis is 15 years. In the Declaration of Richard B. Lee on Behalf of AT&T Corp. in this proceeding (“Lee Decl.”), Mr. Lee explains that the Commission has developed forward-looking projection lives for telecommunications assets based on its review of asset retirement patterns, technological developments, and trends. Lee Decl. Sec. III.A. For digital switching equipment, the range of prescription lives is 12-18 years. We have selected the midpoint of that range – or 15 years – as the economic life of the switch in our life-cycle analysis.
26. Analysis performed by Mr. Lee confirms the reasonableness of the use of 15 years as an approximation of the economic life of a switch. Mr. Lee performed a Geometric Mean Turnover study that measures the average life of an asset based on the time it takes the plant to exhaust a plant balance for that asset. For digital switching, with the range of FCC prescribed lives of 12 to 18 years, the Geometric Mean Life Estimate (“GMLE”) for 2002 is 16.82, and for the period 1998-2001, the GMLE have ranged from 15.64 to 16.88. *Id.* Att. 6, page 3 of 12. Between 1990 and 1997, the GMLE were between 17.81 and 21.08. *Id.* Given these estimates of the average life of digital switches, the choice of 15 years for use in the life cycle analysis is a conservative and reasonable choice.

C. A Proper Economic Life Cycle Switching Cost Study Should Not Include Costs Or Savings Associated With Hypothetical Technology Changes.

27. Switching investments should not reflect the costs of potential technological upgrades. It appears that the Commission is concerned that failure to reflect these costs in unbundled switching costs may result in decreased research and development and less emphasis on deployment of new technologies. *Notice ¶ 81.* That is not the case.
28. Foremost, switch vendors, not the ILECs, undertake research and development into switching technology. Therefore, the costs of such research and development already are included in the switch prices that carriers pay to vendors (and that unbundled switching customers therefore pay to incumbents). Accordingly, there is no need to increase the prices that competitors pay to incumbents to induce vendors to continue to engage in research and development. Indeed, doing so would not change the switch price that the ILECs pay to the vendors; therefore, higher prices for UNE switching would not give the vendors any additional incentive to engage in research and development.
29. Nor is there any legitimate reason to reflect future technology changes in unbundled switching rates to encourage incumbents to deploy the new technology developed by the vendors. Unbundled switching prices are typically updated approximately every three to four years, and there is nothing to preclude an incumbent from seeking a more frequent update if costs have changed substantially as a result of new technology deployment. Therefore, incumbents

always will have the opportunity to recover costs of actually deployed technology through unbundled switching prices adopted at a point in time in a cost proceeding. There is thus no legitimate justification for including technology changes in unbundled switching prices.

30. By contrast, there are myriad reasons to exclude the anticipated costs of technology changes in today's unbundled switching prices. Foremost, charging competitors for technology that does not yet exist is discriminatory and anticompetitive. Incumbents do not today incur costs associated with future technology changes. Therefore, including such costs in unbundled switching prices would place competitors that purchase unbundled switching at a distinct artificial competitive disadvantage. Indeed, it is absurd to require competitors to pay for switching technology that neither exists nor is deployed, particularly because incumbents do not incur such costs.
31. Moreover, it is folly to assume that technology upgrades will result in a net cost. Indeed, technology changes typically result in net cost savings. For example, optical trunk port interfaces that are currently being offered by Lucent and Nortel eliminate the need for converting fiber optics to copper in circuit equipment. In addition, the unit cost of optical trunk switch ports is equivalent to or lower than the unit cost of copper trunk switch ports.⁵ This equipment also requires fewer

⁵ SBC California admitted that fiber optic trunk ports are either less expensive than or cost the same as copper trunk ports. Application 01-02-024, *Joint Application of AT&T Communications of California, Inc. (U 5002 C) and WorldCom, Inc. for the Commission to Reexamine the Recurring Costs and Prices of Unbundled Switching in Its First Annual Review of Unbundled Network Element Costs Pursuant to Ordering Paragraph 11 of D.99-11-050*, (Filed February 21, 2001), Tr. at 677, lines 22-28.

spare replacement parts to be kept on hand, a smaller footprint that significantly conserves building space, and has lower power requirements. One could reasonably anticipate that future investments in upgrade equipment also will provide savings in maintenance and repair expenses, power requirements, as well as being lower in unit cost than the original equipment.⁶ Including some additional technology upgrade investments without incorporating the expected savings associated with the technology upgrades is wrong.

32. Another problem with attempting to reflect “costs” (which may very well be “savings”) associated with future technology changes is that those costs must be properly assigned to the cost-causing services and functions. For example, digital switch processors and switch matrices have massive amounts of spare capacity in terms of narrowband circuit telephony.⁷ Continuing improvements to switches are expected to focus on broadband and data services, not the narrowband capabilities of the switch that are the meat-and-potatoes of unbundled switching. If the incumbents incorporate the broadband and data service upgrades into existing telephony switches, the portion of the total switching costs attributable to narrowband voice will decrease. The net effect should be a *decrease* in the cost of unbundled switching, rather than an increase.⁸

⁶ See Nortel Networks Product Brief, “DMS-Spectrum Peripheral Module” on its Web site www.nortelnetworks.com. Lucent makes similar claims for its Optical Interface Unit (“OIU”) for the 5ESS Switch at its Web site, www.lucent.com, stating the OIU simplifies network operations, lowers operation costs, reduces floor space requirements, and reduces power consumption.

⁷ Nortel Networks explains that its latest processor lays “the foundation for delivering high-volume, data-intensive, next-generation services.” Nortel Product Brief, “DMS SuperNode System XA-Core” on its Web site, www.nortelnetworks.com.

⁸ In many instances, the ILECs have assumed that past upgrade investments accurately

33. For example, the optical trunk port interfaces discussed above are described by one manufacturer as supporting the “network evolution to SONET/SDH, and ATM [packet network].”⁹ The optical trunk port peripheral equipment costs the same or less than traditional copper-based trunk port peripheral equipment on a per trunk basis. If estimated future technology upgrade investments were to be included, then all investment and expense impacts would also have to be forecasted and estimated.
34. The bottom line is that it would be both anticompetitive and impractical to include hypothetical technology changes in the price of unbundled switching. The Commission should thus make clear that such costs should not be included in the life cycle pricing methodology for computing unbundled switching rates.

D. Example: Applying The Proper Life Cycle Theory To Computing The Economic Costs of Switching.

35. Use of the switching life cycle approach provides a straightforward means of computing the economic cost of switching investment. The following is an example of the approach for determining the switching investment applying these principles. This approach provides a relative “weighting” to apply to new switch discounts and growth discounts or to new switch prices and growth prices in determining switching investment and is similar to the approach proposed by AT&T and WorldCom in the Virginia arbitration proceeding and adopted with

reflect the technology upgrades that may occur in the future. This is inappropriate. As described above, future technology upgrades may not be relevant to unbundled switching.

⁹ *Id.*

modifications by the Wireline Competition Bureau in the *Virginia Arb. Order*. These principles can also be applied to both end-office and tandem switches.

36. As an initial matter, the discounts that the ILEC receives for new switches and for growth equipment should be calculated based on the most recent switching price information available from the ILEC, and the appropriate cost of capital, the economic life of the switch (*e.g.*, 15 years), and the assumptions concerning line growth and the frequency of growth additions (*e.g.*, 2 or 3 years) should be determined. The switch should be sized to serve the existing demand for the switch and two years of growth. A switch so sized will reflect the demand for the switch over the period that the UNE prices will remain in effect. Moreover, as we noted above, it is standard industry practice to configure new switches with at least two years of near-term growth capacity.
37. Switch investment should be determined using present value calculations of the investment required for all lines served by the switch over the switch's useful life. A new switch sized to serve current demand and growth for two years is assumed to be installed, along with growth additions every two years to serve the growth in line demand during the economic life of the switch. One can determine the present value of the total investment for the switch over its economic life by adding the investment required to purchase the new switch to the present value of the investment in growth equipment expected to be installed over the life of the switch. The ratio of the investment in the new switch to the total investment provides the weighting of the new switch price or switch discount, and the ratio of

the present value of the growth additions investment to the total investment provides the weighting of the growth additions price or switch discount.¹⁰

Virginia Arb. Order, ¶¶ 401-16.

38. These percentages are then applied either in connection with the appropriate cost model or in connection with the switching investment. If used directly in a cost model (such as SCIS), then the new switch percentage is multiplied by the new switch discount, and the growth additions percentage is multiplied by the growth discount, and the two resulting figures are added to yield a single weighted average discount figure used in the cost model.¹¹ *Id.* ¶ 401. If the switching investment is determined using switch prices that already incorporate the new switch and growth switch discounts, then the new switch percentage weighting is multiplied by the new switch investment, and the growth additions percentage weighting is multiplied by the growth additions investment. The sum of these weighted investments represents the net switching investment for the switch.

¹⁰ Exhibit 1 attached hereto shows the calculation of the new switch percentage and the growth additions percentage. The example yields a new switch percentage of 92 percent and a growth additions percentage of 8 percent, assuming a cost of capital of 7.5 percent, line growth of 1 percent per year, a 15-year economic life of the switch, and growth additions every two years.

¹¹ If the cost model has enough detail to separately identify the getting-started cost of a switch, then the getting-started investment should be computed using only the new switch discount, as this getting-started investment is incurred at the initial placement of the switch. The melded new/growth weighted discount would then be applied to the remaining modular switch equipment that encompasses line and trunk equipment that is purchased both at the initial switch installation and as growth equipment over the life cycle of the switch.

IV. UNBUNDLED LOCAL SWITCH COSTS SHOULD BE RECOVERED THROUGH FLAT, PER-PORT CHARGES.

39. The switching rate structure refers to the measures of capacity or usage by which incumbents charge CLECs for unbundled switching. Recent state and FCC Wireline Competition Bureau decisions in Illinois, Indiana, Minnesota, Utah, Virginia, and Wisconsin,¹² for example, have determined that a flat, per-port fee is the appropriate rate structure. On the other hand, some older state UNE decisions have adopted switching rate structures that combine a flat, per-port charge with a “usage” (*i.e.*, “per minute”) charge. As demonstrated below, the recent decisions reflect the better economic approach to cost recovery. The Commission, accordingly, should require state commissions to implement flat, per-port switching charges rather than usage-related charges.
40. As recognized by the Commission, the rate structure for unbundled switching must reflect the incumbent’s own switching cost structure, because the *price* that incumbents collect for unbundled switching is the *cost* to competitors for providing switching services. It is fundamental economics that the costs incurred by competitors should mirror that of incumbents to avoid creating economic inefficiencies and opportunities for anticompetitive conduct. For example, to the extent that incumbents incur switching costs on a non-traffic-sensitive (“NTS”) basis, competition would be harmed if incumbents were permitted to charge for

¹² See Illinois (Docket No. 98-0396, at p. 68); Indiana (Cause No. 40611-S1 Phase I, 3/28/02, at p. 42); Minnesota (Order, *Setting Prices and Establishing Procedural Schedule – PUC*, MPUC Docket No. P421/CI-01-1375 10/2/02); Utah (Report and Order, *Determination of the Cost of the Unbundled Loop of Qwest Corporation*, Docket No. 01-049-85 (5/5/03)); *Virginia Arbitration Order*, ¶¶ 458-83; Wisconsin (Open Mtg. 12/13/01 Docket No. 5720-TI-161).

unbundled switching on per-minute basis. In that case, incumbents' cost of providing switching would be the same for high-use and low-use customers. Competitors' costs of providing switching, on the other hand, would vary significantly depending on the number of minutes of calls made by their customers, thus providing a competitive advantage for the incumbent with respect to high-use customers, which in many respects are the most lucrative customers.

41. The appropriate rate structure for unbundled switching therefore depends on the switching cost structure faced by the incumbent itself when it purchases switches from its vendors. As demonstrated below, the incumbents' switching costs are driven largely by costs that do not vary with the number of minutes that the switch is used, *i.e.*, they are largely non-traffic-sensitive. To the extent that incumbents do incur traffic-sensitive costs, those costs are "peak-driven" and cannot be efficiently allocated to unbundled switching customers through per-minute charges. Doing so creates substantially more economic inefficiencies and potential for inefficient and anticompetitive results than would be incurred by requiring incumbents to recovery those minimal costs through a flat charge. Accordingly, the appropriate unbundled switching rate structure is a flat, per-port rate.

A. Switching Costs Are Predominantly Insensitive to Usage And Should Therefore Be Recovered Through A Flat Charge.

42. Each switch can be thought of as having two "sides" – one for "line ports" and one for "trunk ports." Line ports connect the switch to each line running from an

end-user customer's location. Each end user's line has its own discrete port. Trunk ports connect the switch to the high-capacity transport "pipes" that run between switches, but are not assigned to a specific user.¹³ Instead, they are assigned to a specific transport pipe, which is the portal through which telecommunications traffic for many different end users flows into and out of the switch. Thus, when a CLEC wishes to provide phone service to an end-user customer by purchasing unbundled switching, the CLEC is assigned the line port on the switch that serves that end-user customer. A CLEC that wishes to also lease shared transport is not assigned a specific trunk port; instead, that CLEC obtains the ability to have its customers' traffic flow through whichever trunk port is tied to the transport facility that must be used to carry that traffic to its ultimate destination. Lying between the port and trunk sides of a switch are the control center and the switch fabric/matrix that routes telecommunications traffic from one side to the other.

43. *Port Side and Trunk Costs.* As discussed above, when an incumbent purchases a new switch, it must decide how many line ports to purchase. The incumbent can either purchase a new switch with enough line ports to serve current and expected future demand, thereby reducing the need for future line port purchases to serve growth, or the incumbent can purchase a new switch with enough line ports to serve only current demand, and add line ports as the demand increases over time. In a similar manner, it may be necessary to add trunk ports as demand increases.

¹³ This discussion is applicable to trunks used for interoffice transport. There also are dedicated trunks that connect a large-capacity business subscriber to the switch.

44. We have reviewed numerous switching contracts between switch manufacturers and incumbents, as well as manufacturer competitive price quotes for new switch purchases. These vendor contracts and quotes often state a flat price per line for the purchase of the entire switch, including line ports, trunk ports, feature hardware and the getting-started costs.
45. *Switch Fabric/Matrix* In theory, the equipment, circuitry and intelligence that routes telecommunications traffic could be usage sensitive to the extent that increases in the number of minutes that a switch is used requires the incumbent to increase the capacity of the electronics in the switch. In practice, however, the switch fabric has not been a limiting component in the past, nor is it expected to be in the future. Moreover, the switch fabric/matrix cost is not usage-sensitive because it does not change as minutes of use increase or decrease.
46. More generally, the technology available in modern switches has eliminated switch exhaust as a practical concern. Switch utilization rates are very low, and usage could increase two- or three-fold without threatening a switch's processing capacity. The Commission's Wireline Competition Bureau summarized the evidence in the Virginia Arbitration, finding that "switch manufacturers today design switches that are limited only in the number of lines that they can serve." *Virginia Arb. Order* ¶ 391. That is, "modern switches typically have large amounts of excess central processor and memory capacity, the usage by any one subscriber or group of subscribers is not expected to press so hard on processor or memory capacity at any one time as to cause call blockage, or a need for

additional capacity to avoid such blockage.”¹⁴ Accordingly, the Bureau concluded that because “no one subscriber or group of subscribers is any more or any less causally responsible for the processor or memory capacity costs,” “[p]rinciples of cost causation . . . support a per line port cost recovery approach because, more than any other approach, it spreads getting started costs to carriers in a manner that treats equally all subscribers served by a switch.” *Id.* ¶ 463. As the modern switch does not exhaust on usage, the same principles supporting per-line port charges apply to other non-peak-period switching costs.

B. Although Certain Peak Period Costs May Be Usage Sensitive, Those Costs Also Should Be Recovered Through A Flat Per-Port Unbundled Switching Charge.

47. A small portion of total switching costs – less than 15% of switching costs – is based on the “peak-period usage.”¹⁵ Peak-period costs refer to costs of equipment capacity that is engineered and purchased based on the peak-period demand of a switch. Peak-period demand refers to the average number of minutes that a switch is used at the busiest time of day for a switch over a period of time. These costs are considered usage-sensitive because they may increase or decrease as the peak-period number of minutes increase or decrease.

¹⁴ *Id.* ¶ 463 (footnote omitted). In the *Virginia Arbitration Proceeding*, Verizon witness Joseph Gansert agreed that the modern switch processor does not exhaust as a result of usage: “our assumption at the current time would be that for most of our switches the central processor is not going to exhaust.” Tr. 5457. *See also* Tr. 5449, Mr. Gansert: “[T]here is no question that in ordering the switch, it’s designed so it will be, in effect, port-limited, so [what] will trigger you to do additions is ports. . . . [I]f you exceeded the [processor] limit, you would have to put in more switches, and over recent years we haven’t been doing that. The reason why is because the vendors have been increasing the capacity of their switches.”

¹⁵ *See, e.g., Virginia Arb. Order* ¶ 473 (summarizing the peak-period cost elements).

48. In theory, it would be economically efficient to recover these costs through a per-minute charge assessed against usage of the switch in peak periods. For example, if the peak period is at 4 p.m. on weekdays, then the usage-related costs of the switch should be recovered through a per-minute fee for usage during the peak period. Customers that do not use the switch at the peak period (*e.g.*, residential customers on this same switch), and therefore do not contribute in any way to the peak-period costs, would not pay the peak-only per-minute charge.
49. Although a per-minute charge assessed for peak-period usage would be the most efficient method of recovering the relevant costs, such a pricing mechanism would be extremely difficult, if not impossible, to implement in practice. *Accord Virginia Arb. Order* ¶ 474 (“Although the parties all agree that peak-period pricing is correct in principle, no party proposes a peak-period rate structure because such an approach is extremely difficult to implement in practice.”). For example, a peak-period pricing methodology would require carriers to meter when customers place calls that traverse particular switches during the peak period, and then to bill customers for that use. The data on peak-period usage (and even the data concerning each switch’s peak period) are not currently available, and it would be excessively costly to implement such a tracking system.
50. In addition, the complexities of identifying accurate peak-period pricing are prohibitive. It is very difficult to determine how many switches’ busy hours a minute of peak-period use will encounter. A call typically will involve at least two switches (an originating and terminating switch), but it is entirely possible for

a local phone call to traverse five switches – originating remote, originating host, tandem, terminating host, and finally the terminating remote. A minute of use placed during the busy hour in the originating remote switch may traverse all the other switches in their respective off-peak periods. Therefore, not only would every switch’s busy hour need to be identified, but the number of switches’ busy hours involved in one minute of use would have to be calculated. This would differ by not only by type of call, such as 911, operator services, and subscriber (business, residential), but also by local network configuration. The local network configuration of host, remote and tandem switches will affect the number of switches involved in a minute of use, and each switch may have a different busy hour.¹⁶ As a result, “[p]eak-period pricing would require either different prices for different switches based on the probabilities of peak-period usage for each switch, or developing some meaningful way to reflect peak-period usage probabilities in statewide or UNE zone average rates.” *Id.* ¶ 474 n.1205.

51. There is also the additional problem of shifting peaks. If customers are charged a per-minute fee for peak-period usage, they may place calls at other times to avoid those charges. These changing usage patterns are likely to “shift” the peak period for each switch (often, to a time period adjacent to the prior peak), at which point the original peak-period rate structure no longer sends the correct price signal. In mathematical terms, it would be necessary to compute a “dynamic equilibrium” based on assumptions about changes in usage that would occur as a result of a

¹⁶ As explained by the Wireline Competition Bureau, “different switches would have different peak periods.” *Virginia Arbitration Order*, ¶ 474 n.1205.

per-minute peak-period charge. Solving such problems based on guesses about human behavior plainly would lead to cost estimates with a high degree of error, and thus likely would result in inefficiencies and market distortions.

52. Because it is not practical or economical to assess peak-period usage charges, a second-best solution must be developed. There are two choices: (1) an average per-minute fee that is assessed against all users of the network over all time periods; and (2) a flat per-port fee that is assessed against all users of the network. Although there are pluses and minuses associated with both solutions, the better choice for unbundled network elements is a flat per-port charge because it would result in far fewer economic inefficiencies and distortions.

1. An Across-The-Board Usage-Related Charge Is Anticompetitive And Economically Inefficient.

53. Assessing a per-minute charge against *all* usage to recover the costs of peak-period usage creates a number of distortions. An across-the-board per minute charge distorts the marketplace, resulting in economic inefficiencies and hence reduced total welfare. Such a pricing mechanism also provides the incumbent with a substantial competitive advantage. As noted, the incumbent does not actually incur any peak-period costs from non-peak-period usage. But, if unbundled switching rates include a per-minute charge for all customers, the competitor could not match the incumbent's pricing without incurring losses. The competitor would have to recover the per-minute charge from all customers, including non-peak users. As a result, the across-the-board per-minute charge

would place competitors at a severe competitive disadvantage compared to the incumbent with respect to many customers. As explained by the Wireline Competition Bureau:

A per MOU [minute of use] price for recovery of shared, peak-period costs . . . may place the competitive LEC at a competitive disadvantage Because [the incumbent's] costs vary with peak-period usage, [the incumbent] may be able to recover shared, peak-period costs from its subscribers by offering a per MOU price for peak-period minutes of use and a zero price for unlimited off-peak minutes of use. A competitive LEC may not be able to recover its costs by offering the same peak/off-peak prices that [the incumbent] offers, however, because the competitive LEC's costs would reflect how [the incumbent] bills the competitive LEC and not how [the incumbent] actually incurs the cost.¹⁷

54. An across-the-board per minute charge also would result in inefficient use of the network. The reason is simple. Whereas customers make more calls when faced with a flat-rate fee, they will make fewer or shorter calls when they are charged a per-minute rate for the calls. That is, an across-the-board per-minute switching rate leads to under-use of the telephone network in non-peak periods. At the same time, an across-the-board per-minute charge does not send the correct price signal concerning network usage in peak-period times, either. The Wireline Competition Bureau also recognized this problem in rejecting an across-the-board per minute charge for switching:

A per MOU [minute of use] price for recovery of these shared, peak-period driven capacity costs . . . would fail to signal to competitive LECs that these costs vary with subscribers' usage during the peak period in particular. Competitive LECs paying for subscribers' off-peak usage

¹⁷ *Virginia Arb. Order* ¶ 476.

based on a price developed by spreading costs over all minutes of use would pay too much relative to the costs for which they bear causal responsibility. Competitive LECs paying this same price for subscribers' peak-period usage would pay too little. A per MOU rate therefore could result in under-utilization of [the incumbent's] switches during non-peak periods and over-utilization during peak periods.¹⁸

2. A Per-Port Flat Fee Is The Most Competitively Neutral and Economically Efficient Method For Recovering Peak-Period Costs.

55. As correctly recognized by the Wireline Competition Bureau, “[a] flat per port price for recovery of these shared, peak-period driven costs . . . avoids the competitive concerns that arise with a per MOU charge.” *Virginia Arb. Order* ¶ 477. Requiring incumbents to recover peak-period costs through a flat, per-port fee ensures that both competitor and incumbents face similar cost structures with respect to non-peak usage of the network – *i.e.*, it ensures that the cost structure for competitors and incumbents do not vary with usage. The application of a flat, per-port charge also substantially reduces the possibility that incumbents will overrecover or underrecover their switching costs, because a flat, per-port fee does not depend on switch usage estimates for each switch in the network.

¹⁸ *Virginia Arbitration Order* ¶ 475. See also Notice of Proposed Rulemaking, *Developing a Unified Intercarrier Compensation Regime*, CC Docket No. 01-92, ¶ 17 (rel. April 27, 2001) (explaining in the context of intercarrier compensation that “[b]ecause these traffic-sensitive charges represent real marginal costs to the carrier that pays them, they impose pressure on the calling party’s carrier to flow these costs through to end-user customers and to adopt traffic sensitive retail prices. If the underlying network costs are non-traffic sensitive, however, then these traffic-sensitive retail rates will reduce network usage to inefficient levels.”)

56. In concept, a flat, per-port fee could result in overuse of the network during peak periods, because peak-period users would not face a price that reflects the full costs that their use imposes on the network. But, the marketplace has confirmed that the risk of call blocking and a concomitant need to augment switch capacity is minimal. Incumbents have for a long time provided local service to residential and some small business customers using “all you can eat” flat, per-line charges, and we are aware of no evidence that these pricing plans have resulted in call blocking or necessitated capacity additions. It therefore follows that a flat, per-port fee for unbundled switching peak-period costs – which would then be passed on to the end-user as a flat-rate local service – also would not result in overuse of the network at peak periods relative to the *status quo*. Indeed, there is no reason to believe that incumbent and competitive LEC end-users would behave differently upon receiving a flat, per-line rate for local telephone service.
57. Thus, comparing the substantial risk that a per-minute peak period unbundled switching charge will lead to severe market distortions, economic inefficiencies and anticompetitive conduct, and the very low risk that a flat, per-port recovery of those costs will result in slight overuse (and probably no overuse), it follows that the Commission should require state commissions to adopt a flat, per-port charge to recover peak-period costs.

CONCLUSION

58. In determining switching investment, the long-run economic cost should be used to capture all the costs of the switching function. Using the “life cycle” approach

that takes into account both a new switch and growth additions every two or three years over the life of the switch, the weighted percentages reflecting the relative switching investment in new and growth switches can be determined on a present value basis and then applied to the switching discounts or actual switch prices in any switch costing model.

59. With respect to recovery of switching investment, the most appropriate rate structure is a flat, per-port charge. This rate structure reflects the realities of modern switch investment, which is largely non-traffic-sensitive, and captures the small portion of traffic sensitive costs through a flat rate that does not produce the economic inefficiencies and distortions of MOU charges.

EXHIBIT 1

VERIFICATION PAGE

I, Terry L. Murray, declare under penalty of perjury that the foregoing is true and correct.

/s/ Terry L. Murray
Terry L. Murray

December 16, 2003

EXHIBIT 1

VERIFICATION PAGE

I, Catherine E. Pitts, declare under penalty of perjury that the foregoing is true and correct.

/s/ Catherine E. Pitt
Catherine E. Pitts

December 16, 2003

EXHIBIT 1

NEW AND GROWTH LINE WEIGHTING

Year	Installed Lines	Additions	PV of Additions	Assumptions
0	1.0000	1.0000	1.0000	growth rate 1.00 %
1	1.0000	0.0000		cost of capital 7.50%
2	1.0201	0.0201	0.0174	periods 15
3	1.0201	0.0000		initial growth year 2
4	1.0406	0.0205	0.0154	
5	1.0406	0.0000		
6	1.0615	0.0209	0.0136	
7	1.0615	0.0000		
8	1.0829	0.0213	0.0120	
9	1.0829	0.0000		
10	1.1046	0.0218	0.0106	
11	1.1046	0.0000		
12	1.1268	0.0222	0.0093	
13	1.1268	0.0000		
14	1.1495	0.0226	0.0082	
15	1.1495	0.0000		
PV Installed Initial Lines			1.0000	
PV Installed Growth Lines			0.0864	
New Line Weight			0.92	
Growth Line Weight			0.08	